

TWO NEW MARINE INTERSTITIAL OSTRACODA (CRUSTACEA: PUSSELLIDAE) FROM FIJI

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Abstract. — *Danipussella rhamphodes* and *Pussella fijiensis* (Podocopida, Bairdiacea) are described based upon specimens collected from coarse intertidal sand on the coral reef in Viti Levu, Fiji. These two species are discernible from congeneric species, mainly in the morphology of carapace and/or copulatory appendage.

Marine interstitial ostracods are one of the useful animal groups in reconstructing historical biogeography (Danielopol & Wouters 1992). However, our knowledge of them is still poor in respect to tropical environments, especially the coral reefs (Danielopol & Hartmann 1986). The present paper deals with two new marine interstitial species of the genera *Danipussella* Wouters, 1988 and *Pussella* Danielopol, 1973 (Pussellidae: Bairdiacea: Podocopida) from Fiji. Several pussellid species including an as yet undescribed new one are known from the southwestern Pacific (Cabioch et al. 1986, Danielopol & Wouters 1992). The ostracods were collected during the survey for marine invertebrates, which was carried out by Dr. Ken-Ichi Tajika, during the Koshida Team Expedition, a part of ODMT (the Research and Exchange Program of Osaka University in the South Pacific Region), in 1985 (Koshida et al. 1986).

Four pussellid specimens were discovered in samples from coarse intertidal sand on the coral reef of the Suva Barrier Reef in the vicinity of Suva in Viti Levu, Fiji. Two of them, possibly a female and a juvenile, sustained damage to the carapace and appendages. Two other, male specimens belonging to the above-mentioned genera were found in good condition. The male holotypes of the two new species are deposited in the National Science Museum, Tokyo (NSMT).

Superfamily Bairdiacea Sars, 1865
Family Pussellidae Danielopol, 1976
Genus *Danipussella* Wouters, 1988
Danipussella rhamphodes, new species
(Figs. 1, 2)

Specimen examined. — Holotype male: Fiji (NSMT-Cr11412). Specimen was collected by Dr. Ken-Ichi Tajika from the Suva Barrier Reef in the vicinity of Suva in Viti Levu, 16 Oct 1985.

Etymology. — The specific name is derived from Greek *rhamphodes* meaning beaklike, in reference to the beak shape of the ventral process of the copulatory appendage.

Description. — Female unknown. Male (holotype). Carapace (Fig. 1-1-3; Fig. 2-1-4) elongate, thin, 0.568 (both valves) mm long, 0.205 (right) mm high; dorsal margin evenly arched (Fig. 1-1 somewhat deformed), connected smoothly with posterior rounded margin; ventral margin concave in the middle; posteroventral margin convex; anterior margin straight, connected with dorsal and ventral margins at almost right angles; anterior surface of valve near anterior margin with two large processes which are triangular in lateral view and have terminal stout spines: internally these processes are connected with the vestibulum. Surface smooth, with some long hairs along the ventral margin. Inner margin parallel to anterior margin; posterior inner lamella

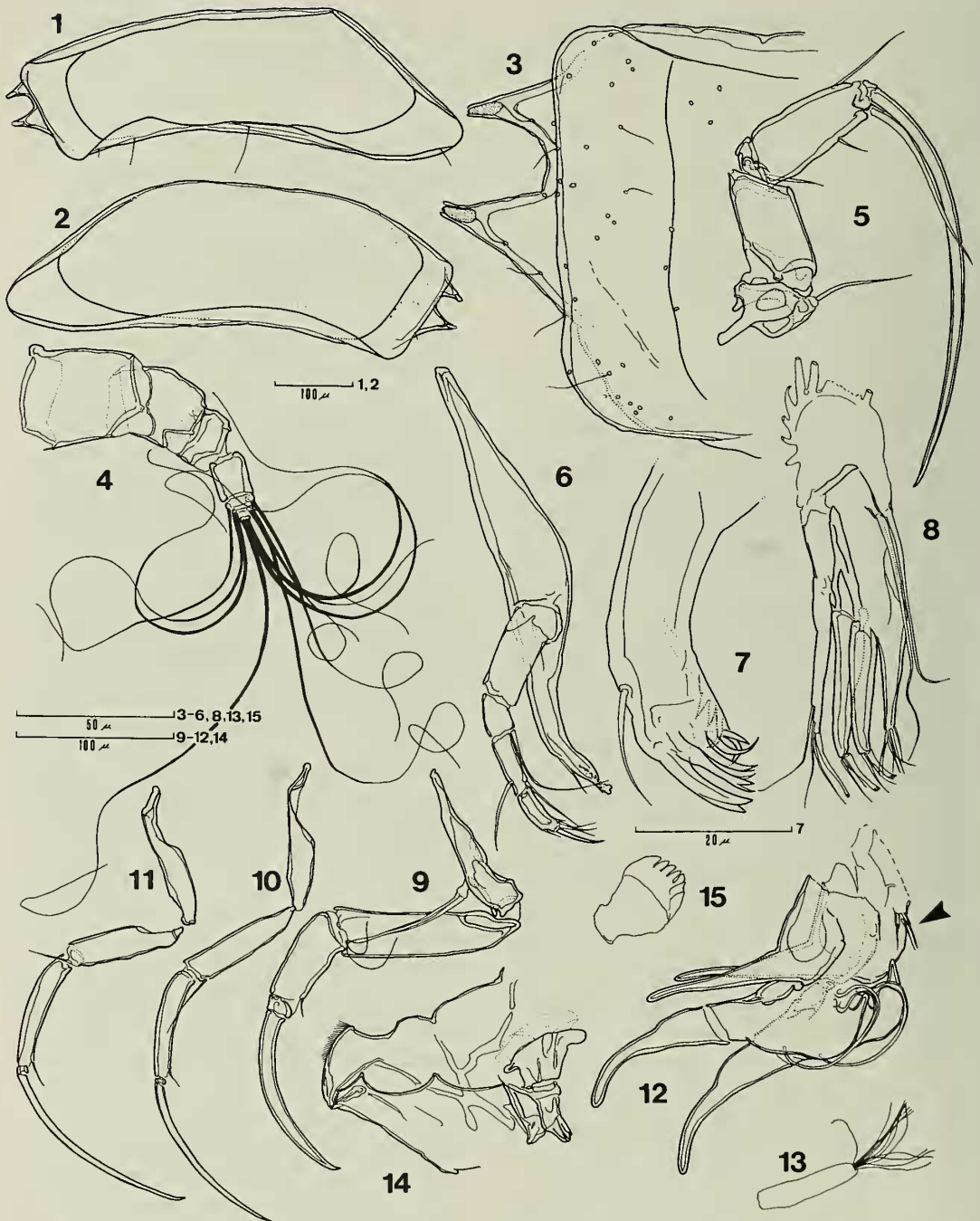


Fig. 1. *Danipussella rhamphodes*, new species. Male (holotype: NSMT-Cr11412). 1. internal view of right valve; 2. internal view of left valve; 3. internal view of anterior part of right valve; 4. right first antenna; 5. right second antenna; 6. right mandible; 7. idem, distal part; 8. right maxillula; 9. left first walking leg; 10. left second walking leg; 11. left third walking leg; 12. furca (arrow), abdominal bristle, and copulatory appendage; 13. brush-like organ; 14. lip; 15. Oesophageal chewing apparatus.

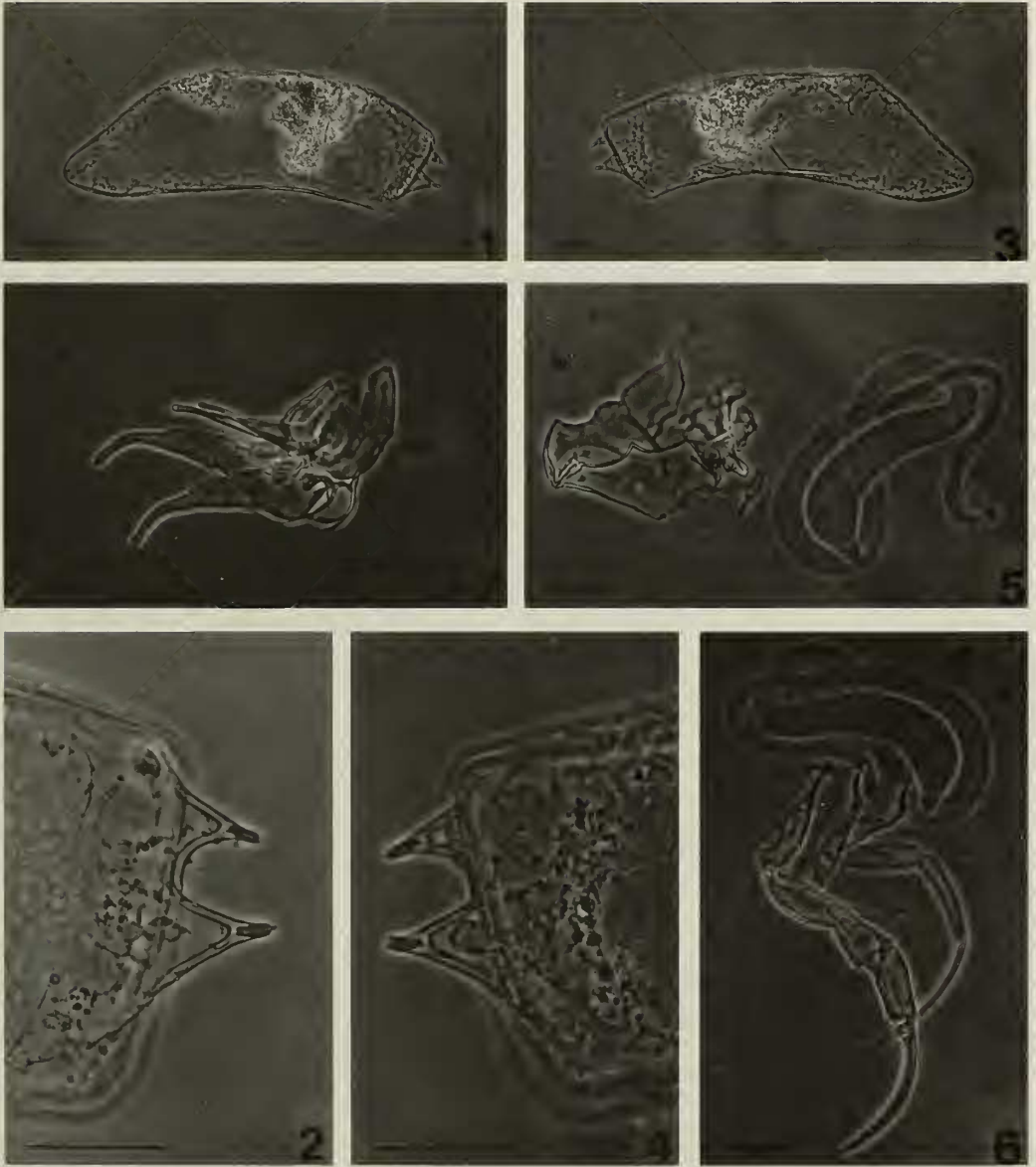


Fig. 2. *Danipussella rhamphodes*, new species. Male (holotype: NSMT-Cr11412). 1. internal view of left valve; 2. idem, anterior part; 3. internal view of right valve; 4. idem, anterior part; 5. lip and testis; 6. legs (leg 2 broken) and testis; 7. furca (arrow) and copulatory appendage. Each bar represents 0.05 mm.

broad, forming a large vestibulum. Adductor muscle scar pattern not clearly visible. Normal pore cannals scattered.

First antenna (Fig. 1-4) seven-segmented; first to third segments gradually decreasing in size; fourth segment quadrangular in lateral view; fifth to seventh segments very

short, each with three, four, and three long setae respectively.

Second antenna (Fig. 1-5) five-segmented; first segment short, with a long ventrodistal seta; second segment somewhat shorter than fourth segment; third segment (basis) short, with a long mediolateral seta

and a very small exopodite which is one-segmented and has one short terminal seta; fourth segment (first endopodite segment) with a long dorsal subterminal seta, a short ventral seta arising from the distal third of the ventral margin, and a long ventrodorsal seta which is 1.6 times as long as the fourth segment; terminal segment small, about one-seventh the length of fourth segment, with a short thin seta and a strong long claw, which is 3.75 times as long as the fourth segment.

Mandible (Fig. 1-6, 7). Masticatory process with a short seta on the anterior margin; distal edge toothed, with nine teeth, of which some teeth are bifurcate or trifurcate. Palp four-segmented; first segment as long as second and third segments combined; second segment about one-half the length of third, with a long posterodorsal seta; third segment with two setae, an anterior subterminal one and a posterodorsal one; fourth segment robust, having a thicker cuticle than preceding three segments, and as long as third segment, with a short anterior subterminal seta, at least four distal setae of which the anteriormost is longer and stronger than the others, and one very short posterior subterminal seta.

Maxillula (Fig. 1-8) furnished with three masticatory lobes; first and second lobes articulated with basal part, with three and four terminal setae respectively of which the ventral one is thicker than the others, and furnished with minute some terminal short teeth; third lobe connected with basal part, with seven terminal setae. Palp unsegmented, with two setiferous ledges along dorsodorsal part, each with one long seta, and two long distal setae of which the ventral one is thicker than the other and furnished with minute terminal teeth. Two long mouthward directed setae present. Respiratory plate with about ten setae.

First walking leg (Fig. 1-9; Fig. 2-6) four-segmented; first segment with two long ventral setae arising from a short process on the ventral margin as illustrated; third segment

with a short anterodorsal seta; length ratio of first to fourth segments and terminal claw 10:11.25:6:1:11.25. Second walking leg (Fig. 1-10) slender, with an anterodorsal seta on second and third segments; length ratio of segments and terminal claw 35:30:25:1:45. Third walking leg (Fig. 1-11; Fig. 2-6) slender, with an anterodorsal seta on second and third segments; length ratio of segments and terminal claw 17.5:15:13.5:1:25.

Furca and abdominal bristle (sensu Wouters 1988) (Fig. 1-12; Fig. 2-7: arrow). Furca consisting of a pair of proximally thickened short setae. Abdominal bristle forming a short thin seta.

Copulatory appendage (Fig. 1-12; Fig. 2-7). Each hemipenis with two anteriorly directed large processes, terminating in a round tip; dorsal process straight, tapered; ventral process beaklike, articulated with basal part, having a thick proximal part and a thin distal part which is slightly curved ventrally. Basal posterodorsal part with a small dorsally pointing process and a long recurved tube, whose proximal part is thickened, near preceding process. Testis (Fig. 2-5, 6) as shown in figures. Brush-shaped organ (Fig. 1-13) located near the base of the first walking leg, consisting of a pair of lobes, whose length is about five times as long as wide; each lobe with long filaments.

Lip (Fig. 1-14; Fig. 2-5) with hairs along anterior margin and several teeth-like structures, as illustrated. Oesophageal chewing apparatus (Fig. 1-15) present near the base of lip.

Remarks.—Wouters (1988) established the genus *Danipussella* based upon the materials from the Comoros as a monotypic genus within the family Pussellidae, containing three genera: *Anchistrocheles*, *Pussella*, and *Danipussella*. In this connection, Warne (1990) proposed the classification of the family Bythocyprididae (Bairdiacea), in which he considered Pussellinae as a subfamily of the family, and assigned *Orlovi-bairdia* McKenzie, 1978 and the new genus *Bythopussella* to the Pussellinae. Further,

Danielopol and Wouters (1992) mention an as yet undescribed new pussellid genus from Papua New Guinea. Further study on the pussellid ostracods is needed.

The type species *Danipussella serpentina* and the present new species are quite similar to each other in morphology of both hard and soft parts. Furthermore, the size of the present new species (0.568 mm) is almost the same as in *D. serpentina* (0.59 mm), which is much larger than *Pussella*-species (0.26 mm). As Wouters (1988:87) predicted, this character seems to have taxonomic value. While the structure of the copulatory appendage of both species is basically similar, the morphology of the ventral process is a useful character in differentiating between them. *D. serpentina* has a long snake-like ventral process, while *D. rhamphodes* has a beaklike one.

Since these two *Danipussella*-species were found at remote distance from each other (the Comoros and Fiji), other species of the genus might be distributed widely in tropical seas.

Pussella fijiensis, new species
(Figs. 3, 4)

Specimen examined.—Holotype, male: Fiji (NSMT-Cr11413). The specimen was collected by Dr. Ken-Ichi Tajika from the Suva Barrier Reef in the vicinity of Suva in Viti Levu, 16 Oct 1985.

Description.—Female unknown. Male (holotype). Carapace (Fig. 3-1, 2; Fig. 4-1-6) thin, 0.452 (right), 0.445 (left) mm long, 0.181 (right), 0.177 (left) mm high. Dorsal and ventral margins arched, almost parallel to each other in anterior two-thirds of the length; posterodorsal margin strongly arched, terminating in a blunt triangular tip where ventral and dorsal margins meet; posteroventral margin with a large posteriorly pointing process, which is connected with vestibulum, and has a wide base and a terminal spine; anterior margin truncate, weakly arched; anterior surface near ante-

rior margin with two large anteriorly pointing processes; upper one smaller than lower one, both connected with vestibulum and furnished with terminal spine. Surface of carapace smooth, with scattered normal pore canals; radial pore canals with short hairs and some long hairs. Inner margin almost parallel to anterior, ventral, and postero-dorsal margins; anterior inner lammella broad. Hingement indistinct, but a small round process detected at the anterodistal edge of the right hinge. Adductor muscle scar (Fig. 4-7) consisting of four scars of different sizes as illustrated.

First antenna (Fig. 3-3) seven-segmented; first to third segments gradually decreasing in size; fourth segment quadrangular in lateral view; fifth to seventh segments very small, with three, four, and three long setae respectively.

Second antenna (Fig. 3-4) five-segmented; first segment with a long ventrodistal seta; second segment somewhat longer than fourth; third segment (basis) short, with a ventrodistal seta and a very small exopodite consisting of one segment, terminating in a short seta; fourth segment (first endopodite segment) with two subterminal setae, a long distal one, and a short ventral one, and a short ventrodistal claw-like seta; terminal segment small, about one-seventh of the length of fourth, with a short ventrodistal seta and a long claw which is about 3 times as long as the fourth and fifth segments combined.

Mandible (Fig. 3-5) similar to preceding species; fourth segment of palp with four distal setae of different lengths.

Maxillula (Fig. 3-6) furnished with three masticatory lobes; first and second lobes separated from base of maxillula, with two terminal setae, the ventral one being thicker than the other, and furnished with some short terminal teeth; third lobe connected with the body, with four distal setae. Palp unsegmented, with one long dorsal seta and two long distal setae, the ventral one thicker than the other, and furnished with some

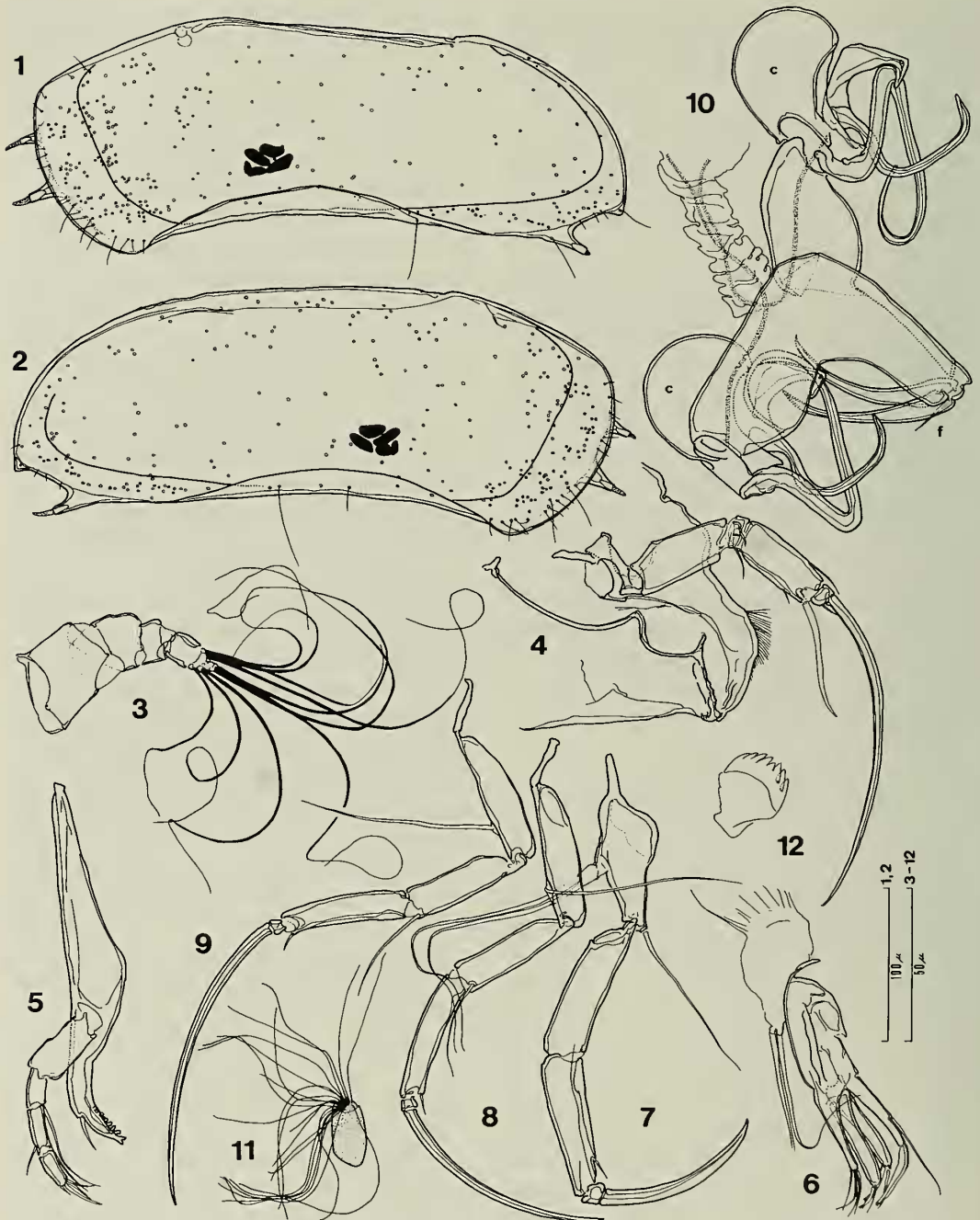


Fig. 3. *Pussella fijiensis*, new species. Male (holotype: NSMT-Cr11413). 1. internal view of right valve; 2. internal view of left valve; 3. right first antenna; 4. right second antenna and lip; 5. right mandible; 6. right maxillula; 7. right first walking leg; 8. right second walking leg; 9. right third walking leg; 10. furca (f) and copulatory appendage (c); 11. brush-like organ; 12. oesophageal chewing apparatus.

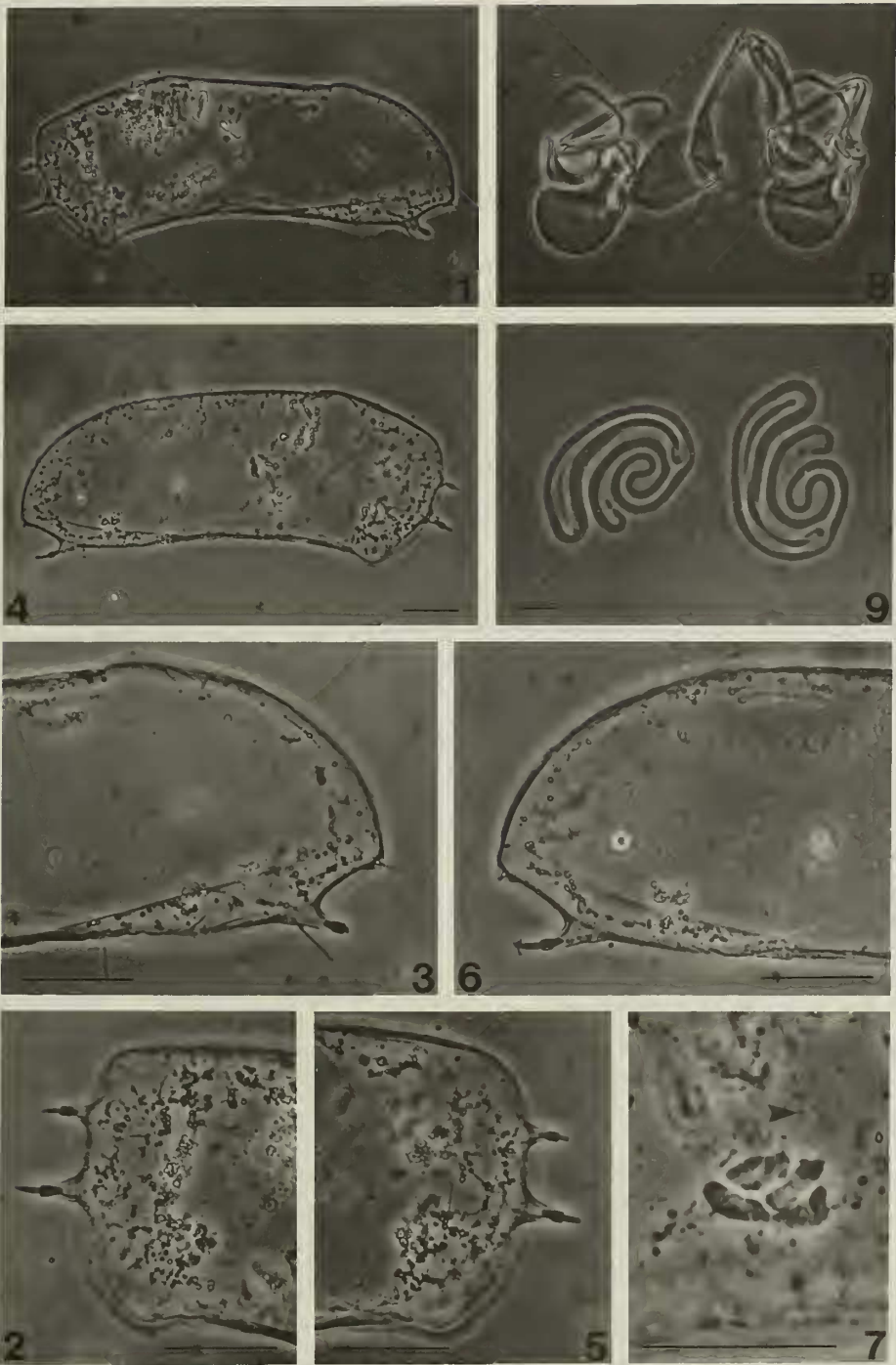


Fig. 4. *Pussella fijiensis*, new species. Male (holotype: NSMT-Cr11413). 1. internal view of right valve; 2. idem, anterior part; 3. idem, posterior part; 4. internal view of left valve; 5. idem, anterior part; 6. idem, posterior part; 7. adductor muscle scar (left); 8. furca and copulatory appendage; 9. testes. Each bar represents 0.05 mm.

short teeth. Two long mouthward directed setae present. Respiratory plate with about ten setae.

First walking leg (Fig. 3-7) four-segmented; first segment with two long ventral setae of equal length, arising from a process on the middle of the ventral margin, and a long dorsodistal seta; third segment with a short subterminal seta on the anterior margin; distal claw strong; length ratio of first to fourth segments and distal claw 8.75:10:8.75:1:10.75. Second walking leg (Fig. 3-8) more slender than first leg; first segment with a long ventral seta; second segment with a thin seta on the anterodistal edge; third segment with a short seta on the anterodistal edge; length ratio of first to fourth segments and distal claw 12.3:10:10.7:1:19.3. Third walking leg (Fig. 3-9) similar to second walking leg; length ratio of first to fourth segments and distal claw 11.7:10:10.3:1:25.

Copulatory appendage (Fig. 3-10; Fig. 4-8). Each hemipenis consisting of a round basal lobe, clasping apparatus (hook-like process with beak-like tip and a long curved claw-like process), and long copulatory tube bending acutely at proximal third and coiling along distal third. Testis (Fig. 4-9) coiled, as shown in figure.

Furca (Fig. 3-10; Fig. 4-8) composed of two juxtaposed claw-like processes (shafts), terminating in a sharp point. A bristle is present between the two shafts.

Brush-shaped organ (Fig. 3-11) consisting of a pair of lobes, whose length is about twice as long as wide; each lobe with long filaments.

Lip (Fig. 3-4) with hairs along anterior margin. Oesophageal chewing apparatus (Fig. 3-12) present.

Remarks.—The genus *Pussella* has one fossil species: *P. infraturonica* Pokorny, 1989 from Lower Turonian (90 million years B.P.) of Bohemia, Czechoslovakia, and three living ones including the present new species: *P. botosaneanui* Danielopol, 1973 from Cuba, *P. danielopoli* Maddocks, 1976 from Bermuda, and *P. fijiensis* sp. nov. Daniel-

opol & Wouters (1992) discussed the evolution of the interstitial ostracods based upon these fossil and recent pussellids and other interstitial species.

The present new species is discernible from *P. botosaneanui* and *P. danielopoli* in the shape of its carapace. As described above, *P. fijiensis* has two anterior and two posterior processes on both valves, but the latter two species have one anterior and one posterior processes and three anterior and three posterior processes. In this respect, the new species resembles *P. infraturonica*, but it is larger and more elongate than Turonian species (Pokorny 1989).

In the male of *P. botosaneanui*, the third endopodite segment of the first walking leg is fused with the distal claw, while that of *P. fijiensis* clearly separated from it. The copulatory appendage of *P. fijiensis* is much different from that of *P. botosaneanui* in the shape of the clasping apparatus and copulatory tube. The male of *P. danielopoli* is unknown.

As Maddocks (1976) pointed out, further research is needed in the tropical interstitial environments, since our knowledge of the members of the genus *Pussella* is still poor.

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Literature Cited

- Cabioch, G., R. Anglada, & J.-F. Babinot. 1986. Microfaunes et paleoenvironnements des récifs frangeants quaternaires de Mamie et Ricaudy (Nouvelle-Calédonie).—Cahiers de Micropaleontologie, N. S. 1(1-2):5-36.

- Danielopol, D. L. 1973. Preliminary report on the new family Pussellidae (Ostracoda, Podocopa). Pp. 145–149 in T. Orghidan et al., eds, *Résultats des expéditions biospéléologiques cubano-roumaines à Cuba* Editura Academiei Republicii Socialiste Romania, Bucuresti.
- , & G. Hartmann. 1986. Ostracoda. Pp. 265–294 in L. Botosaneanu ed., *Stygofauna Mundi*, A faunistic, distributional and ecological synthesis of the world fauna inhabiting subterranean waters (including the marine interstitial). E. J. Brill/Dr. W. Backhuys, Leiden.
- , & K. Wouters. 1992. Evolutionary (paleo)biology of marine interstitial Ostracoda.—*Geobios* 25(2):207–211.
- Koshida, Y., K.-I. Tajika, & S. Horiuchi. 1986. Interim report of ODMT (Research and Exchange Program of Osaka University in the South Pacific region) Koshida Team Expedition in Viti Levu, Fiji, in 1985.—*Science Reports*.—College of General Education, Osaka University 35:13–35.
- Maddocks, R. F. 1976. Pussellinae are interstitial Bairdiidae.—*Micropaleontology* 22(2):194–214.
- Pokorny, V. 1989. *Pussella* and *Saipanetta* (Ostracoda: Crustacea) in the lower Turonian of Bohemia, Czechoslovakia.—*Casopis pro mineralogii a geologii* 34(3):225–233.
- Warne, M. T. 1990. Bythocyprididae (Ostracoda) from the Miocene of the Port Phillip and Western Port Basins, Victoria.—*Proceedings of the Royal Society of Victoria* 102(2):105–115.
- Wouters, K. 1988. Two interesting new interstitial Ostracoda (Crustacea) from the Comoros, with the description of *Danipussella* gen. nov.—*Bulletin de L'institut Royal des Sciences Naturelles de Belgique, Biologie* 58:85–93.

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